German Patent Application No. 195 42 847 A1

FEDERAL REPUBLIC OF GERMANY
GERMAN PATENT OFFICE
PATENT APPLICATION NO. 195 42 847 A1
(Offenlegungsschrift)

Int. Cl.[6]:	B 21 F 35/02 B 21 F 27/16 B 23 P 19/00
Filing No.:	195 42 847.1
Filing Date:	November 17, 1995
Date Laid-open to Public Inspection:	May 22, 1997

SPRING INSERTION STATION FOR A MACHINE TO MANUFACTURE SPRING CORES FOR MATRESSES, CUSHIONS AND CHAIRS

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Documents taken into account for a determination of patentability:	DE 31 01 014 C2 DE 21 25 496 B2 DE 37 00 618 A1 US 33 86 561 DE-AS 15 52 150 Mannel, Reinhold: Automatisierungsfortschritte beim Herstellen von Federkernen [Advances in Automation of Manufacture of Spring Cores]. In: Drahtwelt, 4/1983, p. 86-89

Abstract

The invention pertains to a spring insertion station for a machine for manufacture of spring cores, in particular for mattress cushions and seats, where a transport star gear is provided for insertion of individual springs into an alignment system, whereby a linearly driven alignment system is provided which cooperates with at least two opposing alignment jaws.

Description

The invention pertains to a spring insertion station for a machine according to the preamble of Claim 1.

Machines of this kind are used to install a final manufactured spring to a device in the proper position and ready for further processing. In said device, the springs are to be mounted into a spring core, a cushion or a seat cushion.

One property of this kind of spring insertion station is that a spring is grasped in one grasper of a multiple-arm transport star gear by a spring manufacturing machine—which will not be further described within the framework of the present invention—and this spring is then supplied via a spring insertion station and various other downstream stations to the installation machine.

In another patent attributed to the same applicant, that is, DE 34 16 110 C2, a spring manufacturing machine is described which also uses a transport star gear.

The spring manufactured in this station is inserted into the particular grasper of the transport star gear and is clamped and sent along for further processing.

The adjoining spring insertion station operates in such a manner that pivot jaws in the outlet region of the particular grasper of the transport star gear are provided; these pivot jaws hold the spring between them, and the springs are inserted from the grasper of the transport star gear into these pivot jaws. But the disadvantage of this kind of pivot motion of the holding jaws in the region of the spring insertion station was that the springs inserted there into the spring insertion station could never be positioned accurately enough. This was associated with the disadvantage that the springs had to be precisely aligned at a large number of downstream aligning stations, which was associated with increased machinery expense.

Therefore the invention was based on the problem of refining a spring insertion station according to the preamble of Claim 1 so that the spring can be positioned properly and with high accuracy in the spring insertion station, in order thus to be sent along without significant alignment effort to the following stations.

In this case, the invention is independent of the kind of spring used, i.e., the present invention should be able to handle all wire springs that are double-conical and/or cylindrical and that have open ends or knotted ends (end windings).

Thus, knotted Bonell springs are included herein, and also all other springs that are sold under the protected trademarks of Cosiwell, Cosiflex and Cosisoft.

The essential property of the present invention is that in the spring insertion station, a linearly displaceable alignment system is present. It consists essentially of two mutually opposing halves of synchronously driven band loops, between them the springs are held under compressive force. In addition, in the region of these two synchronously driven band loops there are at least two mutually opposing and linearly driven aligning jaws that align in proper position the particular springs between the two halves of the two band loops.

In this case, the invention provides for any particular alignment of the springs held by clamps between the halves of the two band loops. That is, the invention is composed both of a turning alignment of the springs compressed between the band loops and also a displacement or twisting of the spring held therein.

All possibilities for the alignment are covered by the present invention.

In this regard it is important that the aligning stations with their aligning jaws operate essentially linearly, but the invention is not strictly limited thereto. Also, a combined linear-rotational motion can occur in order to ensure alignment of any largely misaligned spring.

It is essential in this regard that the particular spring be inserted into the belt gap between two synchronously driven belt loops and when they are clamped there under compression between these belt loops, the alignment of the spring can take place with the described aligning jaws.

It is again expressly pointed out that the alignment can occur both by rotation and also by a displacement.

It has turned out to be particularly useful for the particular spring to be inserted prone between mutually opposing halves of synchronously driven belt loops, and then later the spring is turned to its vertical position in a turning station.

The horizontal insertion of the spring has the advantage that the transport star gear inlet connected to the spring insertion station can rotate about a horizontal axis, which is associated with a saving of space, and that simplifies the construction.

The embodiment of the present invention is obtained not only from the object of the individual claims, but rather also from a combination of the individual claims with each other.

All information and properties disclosed in the documentation, including in the summary, in particular the spatial design illustrated in the figures, are claimed as essential to the invention where they are individually new or are new in combination with respect to the state of the art.

The invention will be explained in greater detail below based on the drawings illustrating only one design embodiment. In this case, additional essential properties and advantages of the invention are indicated in the figures and in their description.

We have:

Figure 1: A schematic overview of a complete transport station, proceeding from a transport star gear down to a transfer machine.

Figure 2: A schematic of synchronous belt drive for the two belt loops;

Figure 3: Cross section through the placement of the spring in the insertion position;

Figure 4: Cross section through the same design as per Figure 3 (according to the direction of arrow IV-IV in Figure 5) with the aligned spring;

Figure 5: A front view of the design according to Figure 4.

Figure 1 illustrates that a transport star gear consists of a multiple-arm grasper mechanism that has a number of graspers 18, and a corresponding spring 26 is inserted into the grasper 18 and is clamped therein.

The grasper arm guides the spring into a spring insertion station 2 which is the subject of the present invention.

After the insertion and proper alignment of the spring 26 in the spring insertion station, it is sent to a turning station 3, where the spring is turned from a horizontal position to a vertical position.

At the outlet of the turning station there is a first alignment station that acts as an alignment control station 4 and merely checks whether the node 38 of the spring 26 was positioned properly in the spring insertion station 2.

An additional alignment station 5 makes sure that the last spring of a number of springs positioned one after the other in the region of the belt loops 8,9 is taken from the row; turns it and pushes it against the first spring of the following row into the belt gap of the belt loop 8, 9.

Behind the alignment station 5 there is a transfer device 6 in which the springs are positioned and aligned one after the other following a precise sequence, and then are transferred by a cross slide system into a mounting machine located transverse to the belt loops 8, 9.

The synchronous drive of the belt loops 8, 9 takes place by a belt drive 7 that is illustrated in detail in Figure 2.

A single, central drive unit is provided which drives two synchronously driven drive shafts 10, 11 by a transmission. One toothed belt 12, 13 runs along each drive shaft 10, 11 and each drives a deflection roller 14, 15.

The belt loops 8 and 9 are controlled by the particular deflection roller 14, 15.

Each belt loop consists of an upper and a lower half and the particular spring 26 is inserted between the mutually facing halves of these belt loops 8, 9.

The belt drive 7 is freely programmable, and the drive motor can also be designed as a step motor, and thus using the same insertion speed of the transport star gear 1 into the belt, it is

possible to adjust the distance between the springs precisely and individually through appropriate variation of the belt drive.

The two belt loops 8, 9 run via front deflection rollers 16, 17 and are diverted there.

Figure 3 illustrates that the grasper 18 of the transport star gear 1 executes a turning path 19 in the direction of arrow 20. In this case, it picks up a spring 26 and the spring 26 is held by a thread in its middle. The grasper arm [sic] 18 presses the spring 26 between the belt gap of the belt loops 8, 9 located one after the other, and the particular end winding 37, 37' is placed under tension at the mutually facing halves of the belt loops 8, 9 and the spring is thereby compressed. In this manner, a very dependable mounting of the spring 26 between the two halves of the belt loops 8, 9 will occur.

The spring insertion station 2 consists essentially of an upper slide 21 that is mounted to the free end of a piston rod 22 is driven by a cylinder 23 in the direction of arrow 24 or in the opposite direction (direction of arrow 39).

A lower aligning jaw 27 is located at the slide 21 and furthermore, a roughly horizontally aligned guide surface 28 is provided.

The entire slide 21 is adjustable in height in the range of the longitudinal hole 25 in order to align different spring diameters.

Furthermore, a lower guide surface 29 with an upper, horizontal guide edge 30 is provided, on which the end winding of the spring 26 is placed.

Figure 3 shows the insertion position, and it is evident that the slide 21 is still away from the spring 26 and the spring rests only upon the lower guide edge 30 of the guide plate 29.

Furthermore, the spring is still outside the engagement of the arm bracket 32 indicated below at the spring insertion station 2 and which can be displaced in the vertical direction by means of an air cylinder 33. A retaining bolt 36 is located at the arm bracket 32.

In the insertion position according to Figure 3, the spring is first clamped between the two halves of the belt loops 8, 9, and then according to Figure 4 the air cylinder 23 is filled, so that the piston rod 22 is driven back in the direction of arrow 39. Thus the aligning jaw 27 with its front edge engages with an end winding of the spring 26, as is illustrated in Figure 5.

In this case the aligning jaw 27 on the opposing side is designed the same at 27', and in Figure 5, the particular end windings 37, 37' of the spring 26 are illustrated.

Now, the nodes 38 located roughly in the upper region of the end winding are turned to a lateral position. This is indicated in Figure 4 in that the back beveled guide edge in the direction of arrow 39 rests against the front side of the aligning jaws 27 at the node 38, and thus the spring is turned in the direction of arrow 40 (clockwise).

In order that the spring does not slip out below between the belt loops 8, 9, the spring end rings rest against the guide edge 30 and the invention provides that the retaining bolt 36 of the

arm bracket 32 is moved in the direction of arrow 35, so that the retaining bolt 36 rests against the end windings 37, 37'.

In this case it is necessary that the air cylinder 33 be actuated and that the arm bracket 32 be moved in the direction of the arrow 35, 35', in order to thus bring the retaining bolt 36 to engage with the outer perimeter of the end windings 37,37' of the spring 26. Alternatively, the arm bracket 32 can have a spring-like brace.

In this case, the invention provides that the particular, opposing arm brackets 32, 32' are pivot mounted in the region of one axis of rotation 34 and can be moved in the direction of arrow 35 and in the opposite direction in order to ensure that the retaining bolt 36 in the region of the end windings 37, 37' is clamped against the spring 26 and thus forms a rotary bearing for the turning motion of the spring in the direction of arrow 40.

Figure 3 also shows that in an adjustment range 31, both the lower guide plate 29 and also the upper slide 21 are height adjustable in order to insert different spring diameters in proper, aligned position in the belt gap between the two synchronously driven belt loops 8, 9.

After the clamped placement of the retaining bolts 36, 36' and after positioning and alignment of the spring 26, the arm brackets 32, 32' are pivoted in the direction of arrow 35, 35'. Thus, the spring 26 can be transported along by the belt loop 8, 9 without resting against the retaining bolt 36, 36'.

Alternatively, a displacement (not illustrated) of the retaining bolt 36, 36' can be used.

A significant advantage of the invention is that with relatively simple means, a proper positioning and alignment with insertion of the spring into the belt gap between two synchronously driven belts is possible, and the spring can be turned and/or pushed exactly into a defined position.

List of Reference Symbols

1	Transport star gear
2	Spring insertion station
3	Turning station
4	Alignment station
5	Alignment station
6	Transfer device
7	Belt drive
8	Rear (upper) belt loop
9	Front (lower) belt loop
10	Drive shaft (top)
11	Drive shaft (bottom)

12 Toothed belt
13 Toothed belt
14 Deflection roller (rear)
15 Deflection roller (rear)
16 Deflection roller (front)
17 Deflection roller (front)
18 Grasper
19 Turning path
20 Direction of arrow
21 Slide
22 Piston rod
23 Cylinder
24 Direction of arrow
25 Longitudinal hole (height setting)
26 Spring
27, 27' Aligning jaws
28 Guide surface
29, 29' Guide plate
30 Guide edge
31 Adjustment range
32 Arm bracket 32'
33 Air cylinder
34 Turning axis
35 Direction of arrow
36 Retaining bolt
37 End winding 37'
38 Node
39 Direction of arrow
40 Direction of arrow

Claims

1. Spring insertion station for a machine for the manufacture of spring cores, in particular for mattress cushions and seats, where a transport star gear is provided for insertion of individual springs into an alignment system, characterized in that a linearly driven alignment system is provided which cooperates with at least two opposing aligning jaws (27, 27').

2. Spring insertion station according to Claim 1, characterized in that the alignment jaws (27, 27') can be displaced linearly.

3. Spring insertion station according to Claim 1 or 2, characterized in that the spacing between the aligning jaws (27, 27') is adjustable.

4. Spring insertion station according to one of Claims 1-3, characterized in that in addition, at least one other arm bracket (32, 32') is provided, each with a retaining bolt (36, 36').

5. Spring insertion station according to Claim 4, characterized in that the arm bracket (32) is installed so it can be displaced and/or pivoted.

6. Spring insertion station according to one of Claims 1-5, characterized in that the alignment system consists of two synchronously driven belt loops (8, 9).

7. Spring insertion station according to Claim 6, characterized in that the distance between the belt loops (8, 9) is adjustable.

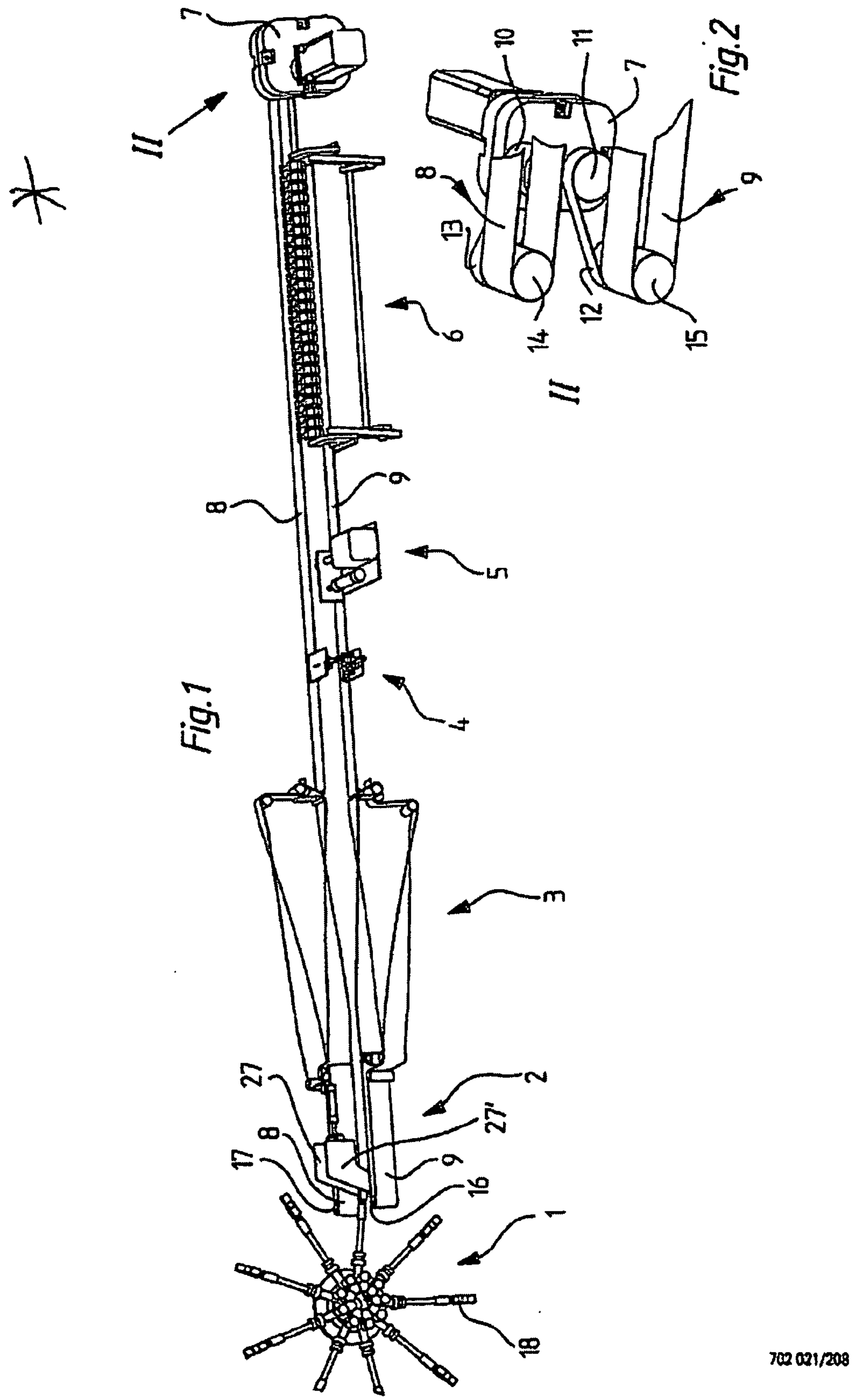
Fig.1
Fig.2
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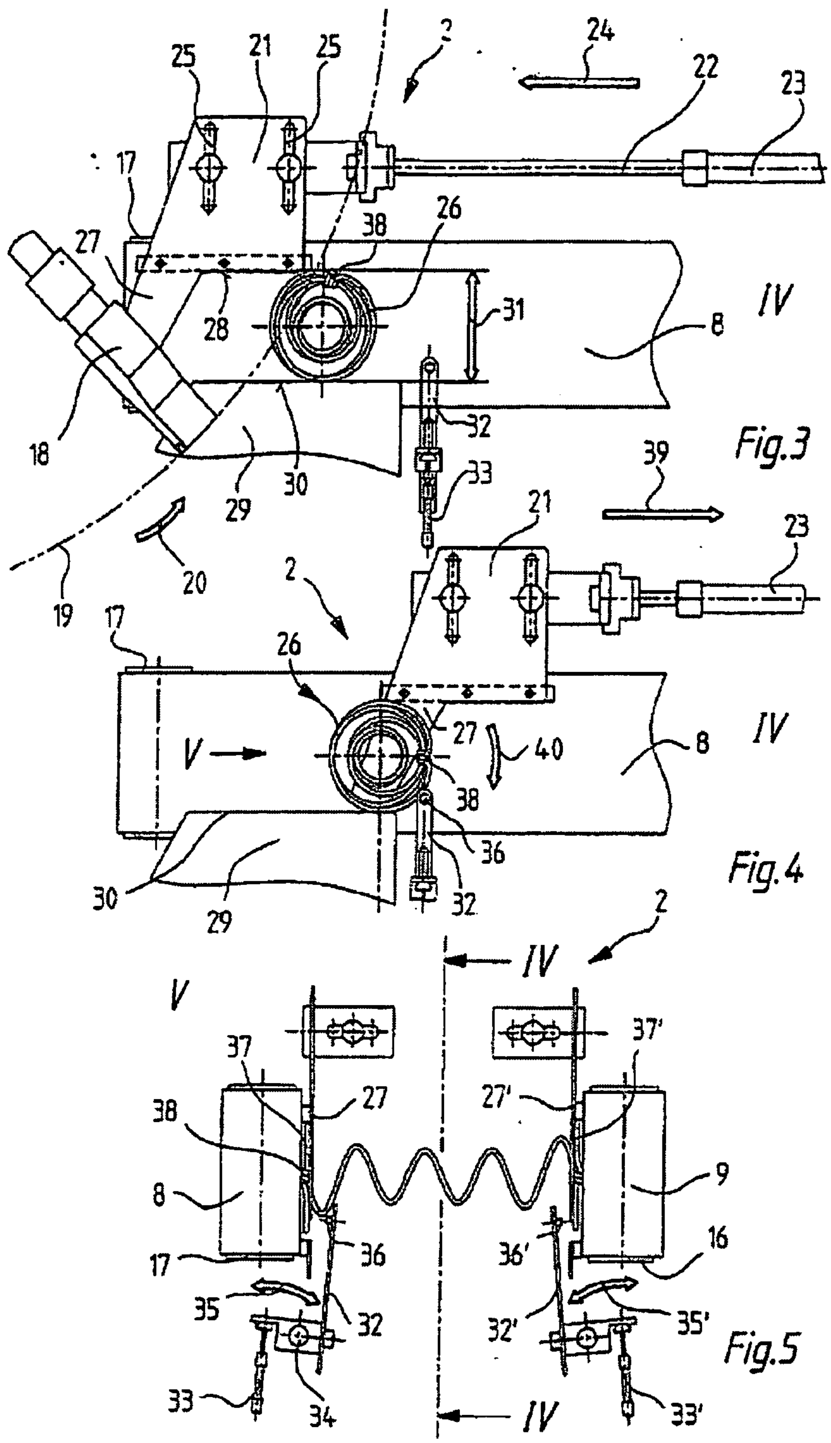
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Fig.3
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Fig.4
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Fig.5
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